

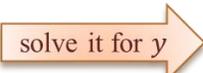
3.4 Linear Inequalities in Two Variables Including Systems of Inequalities

Here are some examples of linear inequalities in two variables. Guess a couple of solutions (x, y) for each inequality.

$x + y \geq 4,$	$y \leq 2x,$	$x - y > 2,$	$y < \frac{1}{3}x - 2$
.....
.....

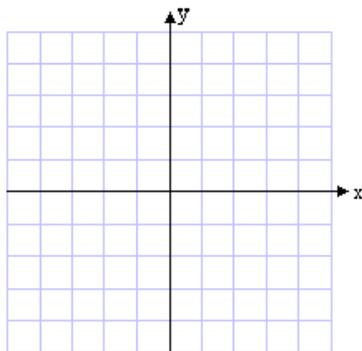
To find a solution (x, y) to such inequality, chose any x -value, solve the inequality for y , and then choose any y -value that would satisfy the obtained inequality.

How could we record the solution set of such inequality?

Consider the first inequality: $x + y \geq 4$ 

Write the solution set using set-builder notation:

Graph this solution set in a system of coordinates. To do this, follow the steps:



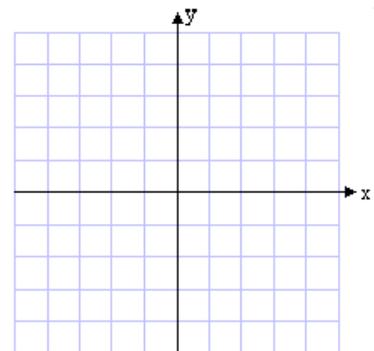
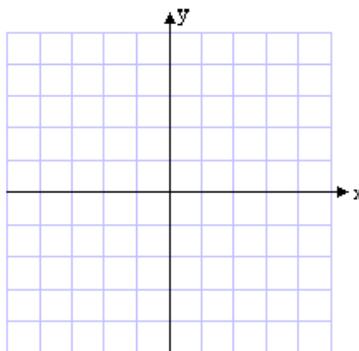
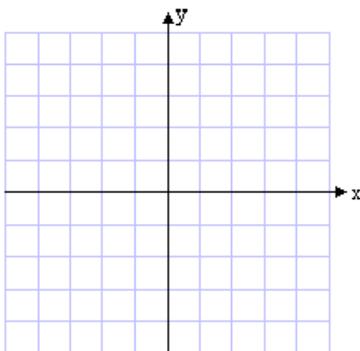
1. Graph the **boundary line** $y = -x + 4$.
If the inequality contains equation (\geq, \leq) , the line should be **solid**; otherwise $(>, <)$, it should be **broken**.
2. Chose a **test point** outside of the line, usually $(0,0)$ or other easy to calculate point. If the test point **satisfies** the inequality, **shade the half-plane** that includes this point; otherwise, shade the opposite half-plane.

Example 1: Graph the inequalities.

a) $y \leq 2x$

b) $x - y > 2$

c) $y > \frac{1}{3}x - 2$

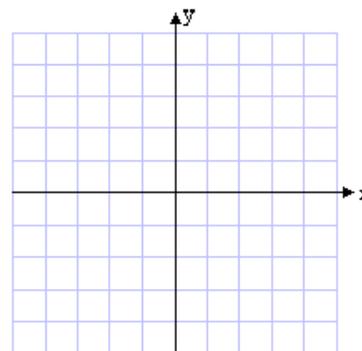
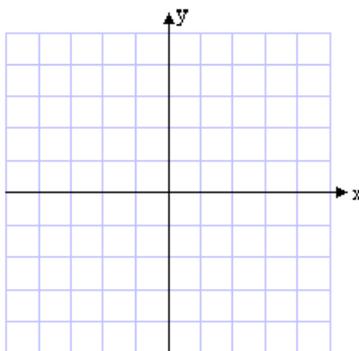
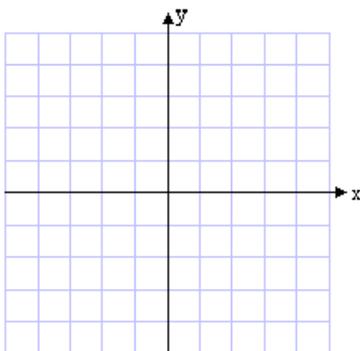


Example 2: Graph the inequalities.

a) $x \leq 3$

b) $y < -2$

c) $x > 0$

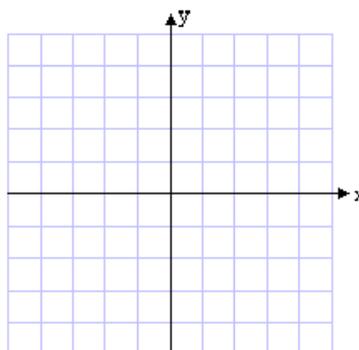
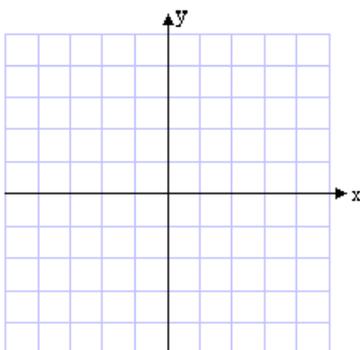


This graphing method is very useful when solving systems of inequalities.

Example 3: Graph the solution set of the system of inequalities.

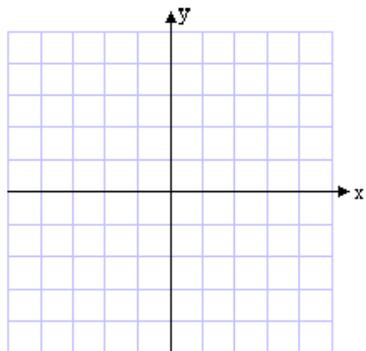
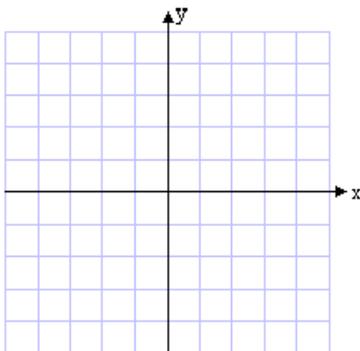
a)
$$\begin{cases} x + y \geq 4 \\ y \leq 2x \end{cases}$$

b) $x + y > 4$ or $y < 2x$



c)
$$\begin{cases} y < \frac{1}{3}x - 2 \\ x \geq 0 \end{cases}$$

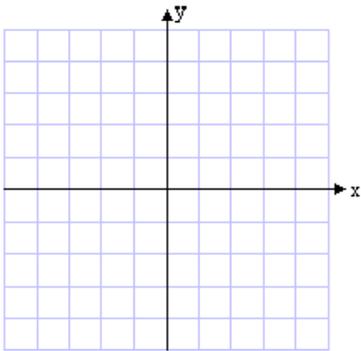
d) $y \geq 1$ or $2x + 3y \leq 6$



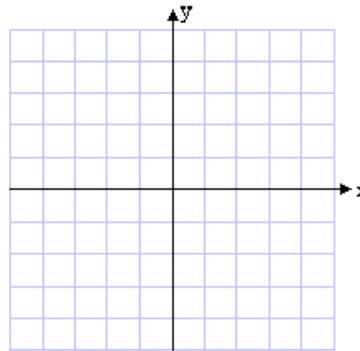
Practice:

1. Rewrite each absolute value inequality as a system of inequalities and graph its solution set.

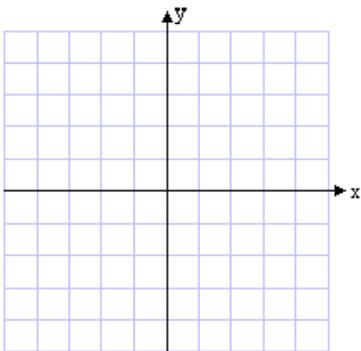
a) $|x - 2| \leq 1$



b) $|x + 1| > 3$



c) $|x - y| < 3$



d) $|x + y| \geq 2$

